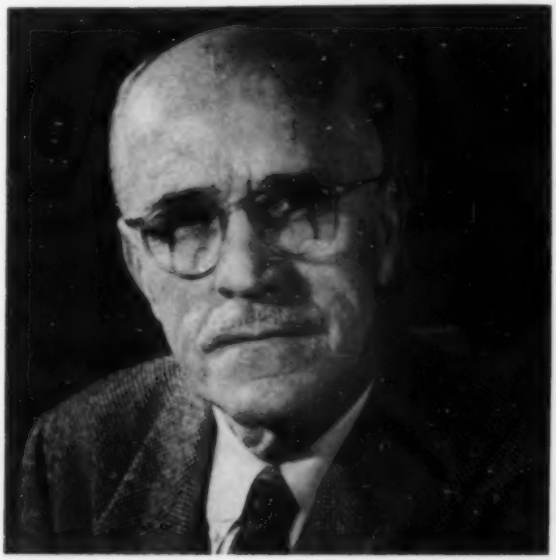
The

CHEMIST

"And on Earth Peace . . ."

December, 1961



Dr. Ernest H. Swift, chairman of the Division of Chemistry and Chemical Engineering of California Institute of Technology, receives Honor Scroll of the Western AIC Chapter.

(See page 439)

Volume XXXVIII

Number 12

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Vol. XXXVIII December, 1961 Number 12

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Deadlines for THE CHEMIST: For the January issue the deadline is Dec. 15.

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IN THIS ISSUE

To Come in January

"We Need to Know" is a bright and timely article, calling attention to the obstacles in communicating with the public. It is by M. H. Arveson, F.A.I.C., coordinator of research for Amoco Chemicals Corp., Chicago, Ill., who received the Honor Scroll of the Chicago AIC Chapter, Oct. 5 . . . For space reasons, "The Chemist's Ethics and the Community" by Irving Michelson of Consumers Union, was postponed to this issue, appropriately enough, since ethics should be considered while making resolutions . . . There will be several other pertinent articles, and an index for THE CHEMIST, 1961.

Advertisers Render a Service to You

At the Hearings Before the Kefauver Committee

Dr. Johan Bjorksten

AIC President

(A report to the AIC Membership)

THE Kefauver Committee originally conducted extensive hearings related to factors influencing the cost of drugs, and as a result, Senator Kefauver sponsored a bill, S. 1552, the Drug Industry Anti-Trust Act, on which he is now holding additional hearings. On October 16-21, these hearings concerned proposals to drastically limit patent protection on pharmaceuticals. Highlights of this bill are:

No drugs should be patentable unless certified by FDA that they have improved therapeutic efficacy.

Exclusive protection should be granted for three years only; after that, complusory licensing at 8% royalty maximum.

The definition of drug was broad enough to cover intermediates.

The AIC Council felt that this was contrary to the interests of the working professional chemist in the drug industry, because:

(1) It would tend to lengthen greatly the time needed to determine whether a pharmaceutical invention would be patentable at all, thereby delaying all decisions on whether a firm would back any idea on new research.

(2) Limitations on patent protection would be certain to result in more reliance on advertising and less on research—thus curtailing opportunities for pharmaceutical research.

Therefore, the Council requested that I represent the AIC as a witness before the Committee, and a statement was prepared, believed to reflect the views of the large majority of our membership and the best interests of the experimental chemist and administrator of chemical research. (Pertinent excerpts from this statement appear on page 394 of the November, 1961, CHEMIST.)

The Testimony

I was scheduled to appear at 10 a.m. on the 16th. Ahead of me was the Commissioner of Patents, Mr. David Ladd, and members of his staff. He testified several hours and explained in great detail the working of our patent system. The Senators questioned him particularly closely about the reasons why so many European countries have only process patents and no product patents, and about the reluctance in some foreign countries to give any protection at all to pharmaceuticals. The Commissioner defended product patents, but rather lamely, I thought, and said that product patents give "a little better protection than process patents." He declined comments on questions related to specific cases, as such comments might be used in future litigation and embarrass the Government. He did

not favor the idea of depending on the Food and Drug Administration, other than in a consulting capacity, in the determination of patentability of a drug application.

The turn of the AIC came. The Commissioner of Patents left with his associates and I took the seat facing Senator Kefauver, who asked me to go ahead. He had evidently already read our statement, for as I proceeded, he gave only perfunctory attention and shuffled the papers before him. Therefore, I abandoned the written statement and proceeded to cover the high points in a colloquial vein, as if I had been explaining the high points to a friend. Senator Kefauver immediately took notice, and from that moment on, he and his colleagues gave us his undivided attention.

An Embarrassing Moment

When I had finished, Senator Kefauver asked if the AIC was a branch of the NAM. I said, of course, "No." He then asked why our statement had been mailed to him in an NAM envelope. I answered truthfully that I did not know, particularly as I had hand-carried copies for the hearing. Senator Kefauver said, "All right, it does not make any difference," but I felt that the effect was bad. On my return to New York, I checked into the matter. I found that the Committee conducting the hearings had required copies of testimony 24 hours in advance. The hearings were held on Monday. The Friday before, I had arrived in New York and had then rephrased our testimony to make it clearer and less legalistic. One of the members of our Committee on Legislation had kindly offered to prepare the copies of the revised testimony for me and to send, by air mail, special delivery, the required advance copies. Unfortunately, his office mailed these copies in a large NAM envelope, without placing on it the name of the AIC as the sender. After I found this out, I wrote the explanation to Senator Kefauver. THE AMERICAN INSTITUTE OF CHEMISTS will have many occasions to represent the viewpoint of the chemist, and it is mandatory that we keep our own clear line.

An Opportunity to Clarify Product Patents

In the course of the presentation and during questions at the hearings, we did have the opportunity to supplement the statement of the Commissioner of Patents as to product patents. I stressed that from a practicing chemist's standpoint, the important distinction exists that infringement is easily determined in a product patent, but that process claims are usually impossible to enforce for a person of limited resources. Thus only a product patent gives the poor man a chance.

Special AIC Announcements

The Chemist Indexed for 1957-1960

The Advisory Board of THE CHEMIST sometime ago recommended that an index be prepared for recent volumes of THE CHEMIST. One of the members of this Board, Bernard E. Schaar, Hon. AIC, graciously agreed to index the main articles in Volumes 34 to 37, covering issues from Jan. 1957 to Dec. 1960. We now need to know how many copies of this index readers of THE CHEMIST would like to have, in order to decide on the most inexpensive way of reproducing it. If you are interested in this general index for 1957-1960, please send a postcard to THE CHEMIST, 60 E. 42nd St., New York 17, N. Y.

The Chemist—Index for 1961

We have prepared a rather full index for Volume 38 (calendar year 1961) of THE CHEMIST. It will be printed in the January, 1962, issue. Hereafter, an index will be published annually.

New Treasurer for New York Chapter

Dr. Evelyn Slobodian, F.A.I.C., New York University, Bellevue Medical Center, 550 First Ave., New York 16, N. Y., is the new treasurer of the New York Chapter. She replaces Edwin A. Wynne, F.A.I.C., who has been called back to active military duty.

Officers of the Michigan Chapter

The Michigan Chapter, which is in the process of getting established, recently elected the following officers:

Chairman, Dr. Mason H. Earing, 20253 Corral Drive, Grosse Isle, Mich.

Secretary, Ronald A. Graham, 2232 Ruskin Road, Trenton, Mich.

Representative to National Council, George F. Sharrard, Wyandotte Chemicals Corp., Clark & Biddle, Wyandotte, Mich.

The Prize Essay

Each year the current student medalists are invited to participate in an essay contest, the subject being "Chemistry (or Chemical Engineering) as a Profession." The prize-winning essay this year was submitted by James M. Thorne of Oakland, Calif., who received a Student Medal from the Western AIC Chapter last Spring. The prize is $100.00. (Read this essay on page 431).

The Coming Council Meeting

The next meeting of the AIC Board of Directors and the National Council will be held, January 16, 1962, at The Chemists' Club, 52 East 41st St., New York 17, N. Y. The Board meets at 5:30 p.m.; the Council at 6:00 p.m. Material for consideration at this meeting should be sent to the AIC office to arrive not later than Jan. 2, 1962.

Report from the Committee on Legislation

Former AIC President Testifies

The Committee on Legislation has noted with pleasure that Dr. Henry B. Hass, former president of the AIC, presented a most effective statement, on behalf of the Association of Research Directors, in opposition to the patent provisions of the Kefauver bill, Drug Industry Anti-Trust Act. Dr. Hass received favorable comments on his remarks both in the public press and the technical journals.

"When You Write, Do it Right"

THE Committee on Legislation has suggested that, on suitable occasions, AIC members may want to write to their Congressmen and express their opinions about proposed legislation. Although it may appear obvious, it is nevertheless true that letters to Congressmen, as in other cases, will be more or less effective, depending somewhat on how they are prepared. The Chamber of Commerce of the United States has prepared a number of suggestions for writing to Congressmen, and the Committee on Legislation thought that a reprint of them might be a helpful checklist:

(1) Address letters properly. Don't confuse a Senator with a Representative.
(2) Be local; tell them how a national question affects your profession, your business, your industry, your community.
(3) Be businesslike; brief but not terse.
(4) Be specific; if you're for something, say so, and tell why. If not, don't hedge, but tell why not.
(5) Be polite; members of Congress deserve respectful treatment.
(6) Be reasonable; ask only practical action.
(7) Be yourself; use your own letterhead and letter style.
(8) Request results; your man is elected to do something.
(9) Ask for an answer; you've told him where you stand, ask where he stands.
(10) Be appreciative; thank him for his good votes, compliment his better speeches, and praise his staff, too.

The National Science Foundation, 1951 Constitution Ave., N.W., Washington 25, D.C. has initiated a new program to provide funds, on a carefully selective and matching basis, for the purchase of scientific equipment for undergraduate instruction. Colleges and universities offering B.S. degrees may request this aid.

Student Medalists of 1961

(Student Medals are awarded on the basis of leadership ability, character, and high scholastic standing.)

STUDENT MEDALIST	COLLEGE	AIC CHAPTER WHICH MADE THE AWARD
Abercrombie, William L.	Howard College	Alabama
Allen, David T.	DePauw University	Chicago
Anderson, David K.	University of Kansas	Midwest
Baker, Charles T.	Southern Illinois University	Chicago
Baker, David C.	University of Missouri	Midwest
Ball, Richard M.	New York University	New York
Barash, Irvin	Drexel Institute of Technology	Philadelphia
Berger, Jack Solomon	Cooper Union	New York
Boykin, David M.	University of Alabama	Alabama
Brand, Warren L.	Arizona State University	Western
Brauch, Ernest W.	New York University	New York
Brayden, Thomas H. Jr.	Southeastern Louisiana College	Louisiana
Broder, Stefan I.	Roosevelt University	Chicago
Brooks, David W., Jr.	New York University	New York
Brown, Larry Clyde	San Diego State College	Western
Brull, Robert	University of Maryland	Washington
Burch, Wendell	Bethany College	Midwest
Buschelman, Robert A.	Loyola University	Western
Button, Allan C.	University of Wisconsin	Chicago
Butzow, John W.	St. Bonaventure	Niagara
Canfield, Patricia A.	Immaculata College	Philadelphia
Capecchi, Mario	Antioch College	Ohio
Carey, George H.	Boston College	New England
Carney, John T.	College of the Holy Cross	New England
Carroll, Alice H.	Swarthmore College	Philadelphia
Cassidy, Patrick J.	St. Peter's College	New Jersey
Cehura, Jean	Smith College	New England
Christopher, Harold Alfred	Worcester Polytechnic Institute	New England
Clark, Donald A.	University of South Dakota	Twin City
Clark, Kenneth H.	Ohio University	Ohio
Cole, William Chester, Jr.	Northeastern University	New England
Cooke, Cynthia	Douglass College Rutgers - The State University	New Jersey
Cory, Robert Paul	Wabash College	Chicago
Davis, Thomas Arthur	University of South Carolina	Piedmont
Daniel, John L.	University of Mississippi	Louisiana
Decker, William H.	Heidelberg College	Ohio
DeLange, Robert	Brigham Young University	Western
de Mauriac, Richard A.	Drexel Institute of Technology	Philadelphia
Dempster, Carol J.	Radcliffe College	New England
Deviny, E. John	Hamline University	Twin City
Diebert, Curtis E.	Fresno State College	Western
Domalavage, Charles G.	LaSalle College	Philadelphia
Doherty, John R.	University of Santa Clara	Western
Dratz, Edward A.	Carleton College	Twin City
Duchamp, David J.	University of Southwestern Louisiana	Louisiana
Duffy, Norman V., Jr.	Georgetown University	Washington
Dunn, Victor	Youngstown University	Ohio
Dunny, Stanley	University of Massachusetts	New England
Eccles, Lillian	Newcomb College	Louisiana

Edwards, Dale C.	Ohio State University	Ohio
Eisen, Edwin O.	Newark College of Engineering	New Jersey
Elfbaum, Stanley Goodman	Northeastern University	New England
Eng, Meng-Teck	Ohio Wesleyan University	Ohio
Evers, Robert C.	University of Dayton	Ohio
Fanta, Wayne I.	Wittenberg University	Ohio
Fehlberg, Richard Allen	Valaparaiso University	Chicago
Feigl, Dorothy	Loyola University	Chicago
Feiertag, Robert	Monmouth College	Chicago
Fentiman, Allison	Muskingum College	Ohio
Fine, Phyllis P.	University of Pennsylvania	Philadelphia
Forbess, Dennis Lynn	University of Oregon	Western
Friedman, Eugene F.	Tulane University	Louisiana
Friedman, Stanley J.	Pennsylvania Military College	Philadelphia
Gattiker, Barbara M.	Ursinus College	Philadelphia
Geiger, Edwin O.	DePaul University	Chicago
Genshaw, Marvin Alden	Michigan College of Mining and Technology	Chicago
Gilje, John	University of Minnesota	Twin City
Goodblatt, Jonathan B.	University of Pennsylvania	Philadelphia
Grigor, Anthony F.	King's College	Philadelphia
Guyton, Charles L.	Mississippi State University	Louisiana
Hahn, Sue Carol	Northern Illinois University	Chicago
Hansen, Peter Jacob	St. Olaf College	Twin City
Harris, David O.	Oregon State University	Western
Heller, Marilyn B.	University of California	Western
Henderson, John Mellish	University of Virginia	Washington
Herm, Ronald Richard	University of Notre Dame	Chicago
Herr, Earl S.	Howard University	Washington
Hiller, John J., Jr.	Lafayette College	Philadelphia
Hodgeson, Jimmie	Louisiana State University	Louisiana
Hohman, William	Mount Union College	Ohio
Hopkins, David R.	University of Massachusetts	New England
Hopkins, George C.	The University of Buffalo	Niagara
Howe, Robert Kenneth	University of Illinois	Chicago
Huchital, Dan	City College of New York	New York
Hussey, Edward	University of Nevada	Western
Jeffers, Peter M.	Lehigh University	Philadelphia
Jones, Yvonne M.	Immaculate Heart College	Western
Judson, John P.	Villanova University	Philadelphia
Kaplan, Elizabeth D.	Mount Holyoke College	New England
Karst, Gretel	Lake Erie College	Ohio
Kasper, Jerome V. V.	California Institute of Technology	Western
Keane, William T.	University of Cincinnati	Ohio
Keilin, Charles D.	George Washington University	Washington
Kissling, Richard L.	Otterbein	Ohio
Kletecka, George	Hiram College	Ohio
Kordsmeier, Norvert	Christian Brothers College	Alabama
Kraus, Bernhard J.	Villanova University	Philadelphia
Landgraf, Jean C.	College of Mount St. Joseph	Ohio
LaRosa, Paul	The City College of N. Y.	New York
Lebowitz, Elliot	Columbia University	New York
Lehman, Thomas A.	Bluffton College	Ohio
Leichtling, Ben	Clarkson College of Technology	Beaver Falls
Lord, Harry Chester, III	Tufts University	New England
Lowry, Larry Kenneth	San Jose State College	Western

Student Medalists (left to right) Charles L. Guyton, Jimmie Hodgeson, Lillian Eccles, Carolyn St. Amant, and Jerry Sherle, receiving medals presented by Dr. H. R. Jolley, S.J., (far right) chairman of the awards committee of the Louisiana AIC Chapter.

Ludden, James R.	Pomona College	Western
Maass, George Joseph	Fordham University	New York
Magne, Joel T.	Amherst College	New England
Manchester, Jason	Ohio State University	Ohio
Marquis, Edward Thomas	Indiana University	Chicago
Martins, Joseph Fratus	Massachusetts Institute of Technology	New England
Mays, Eddie B.	Lane College	Alabama
Mayweather, William T.	Alabama A. & M. College	Alabama
McAvoy, Thomas	Polytechnic Institute of Brooklyn	New York
McClure, Leigh	Centenary College of Louisiana	Louisiana
McCrary, Thomas J.	Tuskegee Institute	Alabama
McCuskey, Anne	Denison University	Ohio
McNutt, Neil Scott	University of Arizona	Western
Meiser, John Henry	Xavier University	Ohio
Miner, Bryant A.	University of Utah	Western
Minke, Albert	University of Toledo	Ohio
Moran, Edward Ernest	Roosevelt University	Chicago
Morris, Frank Graves, Jr.	Vanderbilt University	Alabama
Myers, Wayne	College of Wooster	Ohio
Neuman, R. Geoffrey	C. W. Post College	New York
Newmark, Richard A.	Harvard University	New England
Nix, Edward O.	Emory University	Piedmont
Noftle, Ronald E.	University of New Hampshire	New England
O'Bara, Edward J.	University of Scranton	Philadelphia
Olcott, Richard J.	Beloit College	Chicago
O'Reilly, Marita	Chestnut Hill College	Philadelphia
Pannbacker, Richard G.	Kansas State University	Midwest
Patterson, Howard Hugh	Occidental College	Western
Penton, James	Mississippi College	Louisiana
Perlstein, Jerome	Brandeis University	New England
Peterson, Richard George	Williams College	New England
Peterson, Richard M.	Philadelphia College of Pharmacy and Science	Philadelphia

Phillips, David B.	Miami University	Ohio
Potter, Margaret	St. Lawrence University	Beaver Falls
Ream, Bernard	Seton Hall University	New Jersey
Richards, William Reese	University of California	Western
Rieke, Allyn C.	Knox College	Chicago
Robinson, Wendy M.	Drew University	New Jersey
Rock, Peter Alfred	Boston University	New England
Rodewald, Lynn	Whittier College	Western
Romanelli, Michael	Polytechnic Institute of Brooklyn	New York
Romine, Cynthia	Florence State College	Alabama
Rosenthal, Michael R.	Western Reserve University	Ohio
Rutz, Ernest F.	Rutgers - The State University	New Jersey
Sawczyk, Sylvia	Niagara University	Niagara
Schlaug, Robert W.	Case Institute of Technology	Ohio
Seiderman, Kathy	Barnard College	New York
Servis, Kenneth Lee	Purdue University	Chicago
Sherle, Jerry P.	Loyola University of the South	Louisiana
Shoemaker, Nancy Elizabeth	The American University	Washington
Silbey, Robert J.	Brooklyn College	New York
Simpson, Daniel Lester	University of Vermont	New England
Smith, Malcolm J.	Kent State University	Ohio
Springer, Arthur	Illinois Institute of Technology	Chicago
St. Amant, Carolyn	St. Mary's Dominican College	Louisiana
Staudenmayer, Joseph	Clarkson College of Technology	Beaver Falls
Stein, Harvey	Queens College	New York
Swigert, Roger D.	University of Akron	Ohio
Thach, Robert E.	Princeton University	New Jersey
Thorne, James Meyers	Utah State University	Western
Tokes, Laslo	University of Southern California	Western
Tisue, C. Thomas	Beloit College	Chicago
Unzelman, Ronald F.	University of Redlands	Western
Utley, Carolyn Sue	George Peabody College	Alabama
Vachon, Claire	Villa Maria Academy	Philadelphia
Van Der Voorm, Peter	University of Wichita	Midwest
Wade, Robert L.	University of Georgia	Piedmont
Wagner, John	St. Joseph's College	Philadelphia
Wagner, Norman	Canisius College	Niagara
Weimer, Robert F.	Massachusetts Institute of Technology	New England
Weinstein, Herbert Gerald	Tufts University	New England
Welch, Cletus	Bowling Green State University	Ohio
Wiegand, Gayl H.	University of Iowa	Midwest
Wiener, Irma	Simmons College	New England
Wilkes, Charles Eugene	Worcester Polytechnic Institute	New England
Williams, David	Tennessee Agricultural and Industrial State University	Alabama
Wilson, John Edward	University of Notre Dame	Chicago
Wittenbrook, Lawrence S.	Fenn College	Ohio
Wood, Herbert Thomas	The Catholic University of America	Washington
Woods, Robert Claude	Georgia Institute of Technology	Piedmont
Wyatt, Robert E.	Illinois Institute of Technology	Chicago
Wysocki, Donald C.	John Carroll University	Ohio
Yax, Jim	Regis College	Midwest
Ziller, Steve	Rockhurst College	Midwest

Chemistry as a Profession

James M. Thorne

5747 Vincente St., Oakland 9, Calif.

(This paper was chosen by the Committee on Student Medal Awards as "outstandingly the best" essay submitted in the Student Medalist Essay Contest. The author, a graduate of Utah State University, last Spring received a Student Medal from the Western AIC Chapter.)

THE profession of chemistry promises a most stimulating and rewarding career. To bring real satisfaction to a man his vocation must be able to engross him deeply. Chemistry certainly has the potential of doing this. It is so easy to lose yourself in verifying a hunch you have. You seem always to be just on the verge of success, and yet as you look back you are amazed at the time you have spent—satisfying time spent fulfilling the human need to explore. True, there may be petty frustrations and apparent failures, but they often serve to create new fields of inquiry. Exploration of an anomaly may disclose a wealth of pertinent information.

But the researcher is not the only one to share the stimulus of discovery. Even though the student is far removed in time and space, he discovers and invents along with Gibbs, and Fischer, and Faraday as he learns of their works. The excitement is often diminished because the student has invested less time searching for the answer, but the concept bursts into being in his mind the same as it did with the first man to conceive it. After making a few of these rediscoveries, you can hardly keep from placing a higher estimate on man's potential and on your own chance to achieve success.

This self-assurance has become a fundamental attitude of science which distinguishes it from many other professions. Scientists seem to believe that they (as a group) can accomplish anything reasonable and most things that are not presently reasonable. This optimism is based on the evidence of unbelievable scientific progress during the last century. It is definitely reassuring to be part of a movement which has such a record and such an outlook on the future.

The foregoing optimism must be qualified in two ways. First, there is no guarantee that the scientific community will meet the challenge of the world's urgent maladies. These problems need not be enumerated here, but leaving one unsolved could be disastrous to society. On the other hand, when was there a time that human existence was easily and completely secure? And how can there be success, if there is no possibility

of failure? To the adventuresome it brings an exciting challenge, not fear.

Second, becoming a part of the modern scientific movement is no easy matter. The prerequisites are hours of unrelenting effort and a genuine desire to succeed. No one is disqualified because of race, or birth, or former pursuits in life. The process of scientific education produces a rather choice group by natural selection. People voluntarily leave chemistry if calculus hopelessly confuses them, or if learning the details of organic synthesis becomes too uncomfortable. A real sense of accomplishment goes along with a degree in chemistry.

It cannot be said that the profession of chemistry provides an unusual amount of security. There are no unions to feather-bed for a chemist; he is responsible for taking care of himself. His only security is his training coupled with his ability to produce. But this is the way it must be. Guaranteed security and the freedom science requires are incompatible.

Progress in science often comes through doubt of traditional concepts and dissatisfaction with present conditions. This attitude of dissent is manifest in other phases of a scientist's life. In political attitudes scientists tend to be quite liberal, and many are definitely left-wing. Also, it is possible among scientists to find some rather rare methods of spending leisure time. Their tastes in art, music, and literature also show striking individuality.

But the privilege of dissent is not often abused by men of science—particularly not in the publications of the exact sciences. Few documents are checked so closely, worded so conservatively, or reviewed so thoroughly. This self-imposed control is an outgrowth of the scientific method and the ethic of science, as Bronowski has pointed out so forcibly. Scientists the world over adhere tenaciously to this principle not because they are forced to, but because they know the detrimental effect errors have on their endeavors. One need only cite the confusion caused by an erroneous value for the viscosity of air being used by Millikan and others in determining the charge on the electron.

There are several unique characteristics of scientific information. No measurement is considered absolute—precision and accuracy are of major concern. An exacting scientist investigates and evaluates the sources of all his information, scientific or otherwise. Neither are concepts or theories considered absolutely true, but forever tentative and subject to new information. In contrast to the average person, the scientist thoroughly explores the basic facts and assumptions upon which his concepts rest. Inevitably he realizes there is no absolute way of establishing the truth

of modern science (or anything else for that matter), although the fundamental elements of the exact sciences rest on on extremely high degree of probability. Nevertheless, the great superstructure of science is not founded on bedrock. This is not a crippling disadvantage; it simply makes possible progress along lines of thought that now appear to be dead ends.

This whole concept of the relativeness of human knowledge causes one to revolt at dogmatism and authoritarianism. At the same time science gives nothing absolute in replacement. Many scientists conform to rather authoritarian religions, partly because they are not satisfied with purely rational explanations of religious matters, but primarily because they recognize divine revelation as a possible source of truth and guidance in an area where few scientific facts are available. But in general it might be said that atrophy of authoritarian concepts is an occuptional hazard in chemistry and related fields.

The profession of chemistry is full of striking paradoxes, a few of which are described in the following paragraphs:

With some thoughtful study and research, a person can become the foremost authority in the world on some small phase of chemistry. Indeed, the candidate for a doctor's degree in chemistry is often expected to be just that. You can hardly help but feel a little pride if you are such an authority, but 15 minutes with *Chemical Abstracts* can be a humbling experience, if you realize how many hundreds of other chemists are also experts. Your contribution can seem quite small then.

The literature is so full of scientific information that it appears to the casual observer as if each chemist were flooded with new facts just begging to be recorded. But let the observer try to uncover some significant new information. It will probably shock him to find how much a little new truth represents in terms of time and money. Our universe seems unreasonably reluctant to show the details and organization of her workings.

Even the relationship a chemist has to natural phenomena is a little paradoxical. A number of things make man's understanding of nature seem rather shallow. The state of understanding (in the usual sense) is nothing more than being sufficiently familiar to dull your curiosity, but there remain unanswered fundamental questions about every significant subject. Scientific theories often define a subject in terms of operations where no attempt is made to "explain" the phenomenon. According to a definition given by Warren Weaver in *Proceedings of the American Philosophical Society*, Oct. 17, 1960,

> It is impossible to explain phenomena, and it is in fact senseless to try. All you can do—and this is a triumph of great dimensions—is to *deal successfully* with phenomena."

He also states that Goedel has proved,

> . . . that it is impossible—theoretically impossible, not just unreasonably difficult—to prove the consistency of any set of postulates which is, so to speak, rich enough in content to be interesting,

and that

> such a system is essentially incomplete. Within the system it is always possible to ask questions which are undecidable.

In spite of all this, the success of science is over-powering. In the words of the mathematician-poet, Clarence R. Wilie, Jr.,

> Yet bridges stand, and men no longer crawl
> In two dimensions. And such triumphs stem
> In no small measure from the power this game
> Played with the thrice-attentuated shades
> Of things, has over their originals.
> How frail the wand, but how profound the spell!

From these paradoxes it follows that if variety is the spice of life, this field of chemistry must be delightfully flavorful.

An apparent inconsistency in the field of chemistry is that those who excel in research often accept administrative positions which end their laboratory productivity. It seems a shame that those who succeed most fully are eliminated from direct research, but there are good reasons for this; reasons based on unselfish motives. First, the researcher may be more productive by being free from experimental approaches. His judgment is being utilized to direct the research of others. This is not true in certain purely governmental positions filled by scientists. Men accept these positions because of their training, not in spite of it. I choose to believe these men do not accept these positions because of the recognition they receive, but rather they are compelled by a reasonably objective estimate of their capabilities and of what they can contribute to society.

Proper scientific training includes many things which qualify a person to be a leader of men. A good scientist has an analytical approach to all problems. He is thorough in obtaining information and he demands complete honesty. His approach to problems is optimistic and liberal, yet he pays attention to detail. I conceive of scientists in government as men of conviction with specific, practical ideas about improving society. C. P. Snow and many others maintain that we urgently need more such men as we struggle to survive this scientific revolution.

But leadership is not all that is required. Public understanding and support are becoming increasingly more crucial to scientists in and out of

government. People look at scientists too frequently as unfeeling men busily creating monsters with no concern for human destiny. No science-influenced government could work effectively without support based on a better understanding than this. Admittedly, science has created some terrifying nuclear and chemical weapons, and must share the credit or the blame for their use. But public misunderstanding is breeding hysteria with the threat of nuclear war and radioactive fallout as focal points. When it rains in New York, AEC representatives get telephone calls inquiring about radiation levels in the rain. This is a normal thing to ask, but often the inquirer will break into sobs and mumble something like, "What's going to become of the world?" Radiation can truly be a fearsome thing, but present conditions do not warrant this type of hysteria.

Facts are our best defense against panic and foolish decisions, but the public seems to be swayed too easily by exaggerated, emotional claims. Too few try to make a reasonable evaluation of the facts and the reliability of their sources of information. It is clear that a major responsibility of those whose profession is chemistry is to win the confidence of the general public and put their thinking on a firmer basis. Opportunities are manifold—especially with the younger generation.

I am convinced that chemistry holds more appeal for the non-scientist than do most sciences for these reasons: First, people feel a close connection to chemistry because of their daily association with the products of chemistry. Second, color is a major attracting force in advertising, ond chemistry definitely has it. Third, it is possible to perform simple chemical experiments cheaply and conveniently, even at home. These features suggest that public interest in chemistry could be stimulated easily, thus making it possible to impart scientific methods and attitudes effectively. Chemists are fortunate in having such attractive subject matter, but it becomes that much more their responsibility to carry science to the general public.

One of the outgrowths of public misunderstanding is a constant stream of charges from reactionaries. Adversaries of science are becoming fewer, but there are still those who make accusations of godlessness, vanity, and deception. These men are often proponents of the more conservative religions. But according to Sir Cyril Hinshelwood (Address at the opening of the Royal Society's Tercentenary Celebrations),

> . . . the men of science themselves, as far as can be judged, have numbered about the same proportion of religious believers as the generality of people. Nor have they been conspicuously less well endowed with kindness or morality. Indeed an assurance that ultimate values of goodness and beauty can never be shaken by the pursuit of truth, wherever it may lead, is perhaps the sign of a robuster faith than is shown by recoil from every

> new and seemingly disturbing fact . . . Indeed there would seem to be no inconsistency in believing that scientific knowledge is itself one of the great instruments of higher ends.

He further transcends the thinking of the adversaries of science by saying the future is "more than deeply hidden: it is uncreated."

As one chooses a vocation, he should seriously ask himself if security and tranquility are the ultimate goals of his life. It is a serious misfortune to society each time someone chooses these goals. Those whose profession is chemistry have rejected the easy life. They have become members of the scientific community which is presently "creating the future."

The Big Question

Robert E. Thach

47 Park Avenue Extension, Arlington, Mass.

(Excerpts from an essay received in the AIC Student Medalist Essay Contest. The judges of the Contest called attention to these excerpts, because, "through a historic approach, these sentences pose the big question to today's profession of chemist in a way that all of us should ponder.")

WILL chemistry, and all of science in general, become a "Frankenstein" which its creator can no longer control? In the face of dark conjectures about the future of our civilization, the layman is apt to turn on the scientist with: "You have gotten us into all this, now how can you get us out?" To the average chemist, this challenge comes as a complete surprise. He is even more surprised that he should be expected to "do something" about the direction in which our society is tending.

Men such as Benjamin Franklin and Count Rumford were not only great statesmen, but made contributions of fundamental importance to both basic and applied science. Characteristic of both these men was an astute awareness of the world of human affairs as well as that of natural phenomena. Both possessed the gift of genius, yet neither was intellectually aloof.

A chemist can no longer be the specialist he once was. We have seen that in the past the chemist could afford to ignore the political environment in which he worked. If his theories and inventions were used for destructive purposes, he rationalized, it was not his fault. Many still hold this view today, but it is becoming more and more obviously naive in the face of the vast destructive forces which he alone has unleashed. The answer does not lie in editing one's discoveries, to withhold whatever information seems capable of being misused. Franklin and Rumford have set the example, and it is time that professional chemists recognized it. We have pointed out that such an assumption of broader responsibility is a logical consequence of historic trends. Never before has the chemist been in a position to direct the use of his ideas. It remains for him to actively seek this responsibility. This is the necessary future of the scientific profession as a whole, and the future of our civilization depends upon it.

Mike Baker, F.A.I.C., president of the m. h. Baker Co., Minneapolis, Minn., announces the appointment of Louis Blecher as technical service representative.

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Positions Available

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Regular Army commissions are open to graduate engineers, pharmacists, educators, bacteriologists, or chemists, if they meet eligibility requirements in Army Regulation 601-100, Sec. VI. Interested persons may contact the Professor of Military Science at colleges; the nearest Recruiting Station, the nearest Reserve Center, or the Adjutant General Section, Officer Branch, First U. S. Army, Governors Island, New York 4, N. Y.

Dr. A. Edward A. Hudson, F.A.I.C., is now head of the chemistry department of Lane College, Jackson, Tenn.

Challenges to College Chemistry Curricula

Dr. Ernest H. Swift

Chairman, Division of Chemistry & Chemical Engineering, California Institute of Technology, Pasadena, Calif.

(Presented, here somewhat condensed, when the author received the Honor Scroll of the Western AIC Chapter, in Los Angeles, Calif., September 20, 1961).

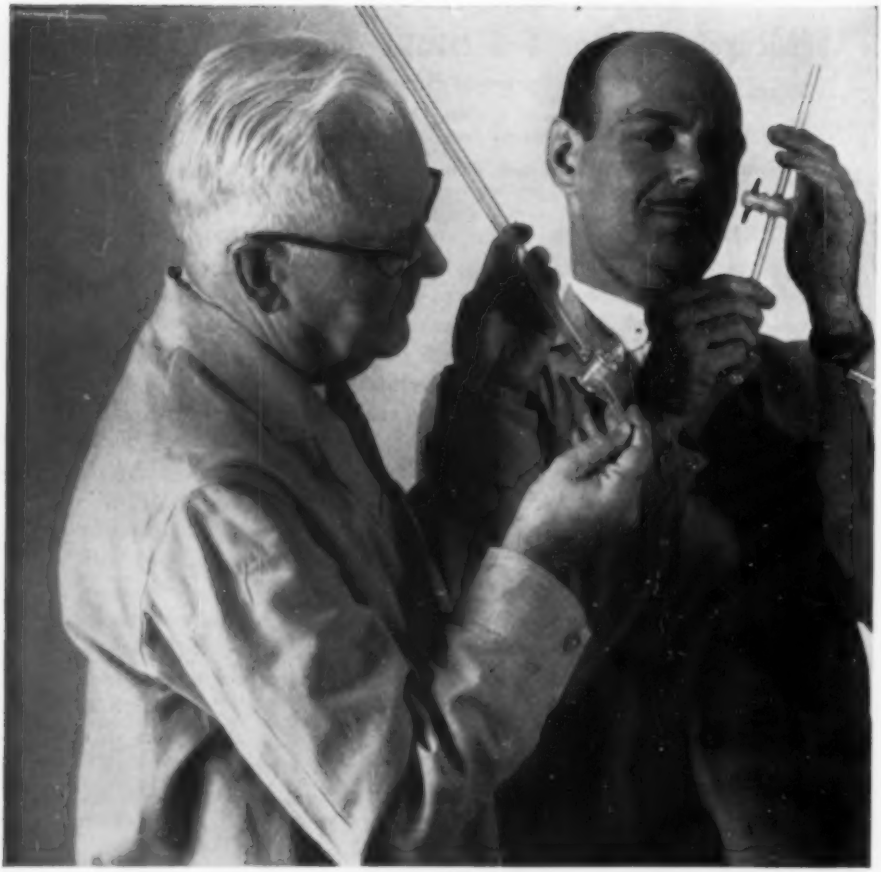
CURRENT chemistry and science curricula face three outstanding challenges. The first of these results from efforts being made to improve the high school mathematics and science courses. There is a public impression that it took Sputnik I to awaken an interest in the teaching of high school science. As evidence to the contrary, there is the ambitious project, activated a full year before Sputnik I, whose objective was the improvement of the teaching of physics in the high schools. Initially sponsored by the National Science Foundation, and directed by Prof. Zacharias of the Massachusetts Institute of Technology, it is still active. It involves the cooperative effort of college and high school teachers nationally, and several million dollars have been expended. A text and laboratory manual, supplementary monographs, demonstration experiments, and various teaching aids have been made available.

Similar programs are now in effect for improving high school courses in mathematics, chemistry, and biology. At present, under NSF sponsorship, two experimental high school chemistry texts are being developed. The first stresses the types of chemical bonds as a logical approach to chemistry; some 250 schools will use this text experimentally next year. The second text emphasizes a more experimental approach; about 125 schools will use this. Increasing availability of these texts will raise the general level of high school chemistry courses.

Also preceding Sputnik I by several years, was the NSF program of summer institutes and academic year refresher courses for high school science teachers. During the summer of 1961, there were 21 of these summer institutes held throughout the country. Ten were concerned with training teachers to use the two experimental texts mentioned above.

Another activity, after Sputnik I, with a significant effect on high school science teaching, has been the televised Continental Classroom series in chemistry and physics. High school teachers endeavored to prepare themselves to meet the inevitable barrage of questions from their students who were viewing these series. An increasing number of high schools are giving a second chemistry course, which qualifies students to take the College Board Advanced Placement Examinations, with the possibility of receiving

(Continued on page 442)



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part of the glass, not an enamel put into etch marks—the enamel can wear away and the etch marks weaken the glass, so we eliminated both. Look at the tip under a glass and you'll see *two* ground bevels—they take away sharp edges which can snag and chip.

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credit for the college general chemistry course.

These efforts will continue to have a significant effect on the quality of the high school science courses. Thus the colleges are challenged to revise their curricula to take advantage of these trends. Not to do so would be grossly unfair to high school teachers who have developed good courses and to students who have taken them.

The second challenge to college science curricula comes from what Dr. Joseph B. Platt, president, Harvey Mudd College, has called the knowledge explosion. A semanticist might prefer publication explosion. Dr. Platt measured this in publication units. Addressing a Conference of Academic Deans, he pointed out that John Harvard gave a library of 300 volumes to Harvard College in 1636, and that the current Harvard library has about 6-million volumes. This represents a doubling in the number of volumes every 20 years, which is representative of other university libraries. The publication rate increase for the sciences doubles every 10 years. In the July 17, 1961, issue of *Chemical & Engineering News,* the director of Chemical Abstracts Service cited data showing that chemical literature now doubles every 8.3 years. Do these figures imply that 30 times as much information must be pumped into a science student as 50 years ago; or more frightening, 1,000 times as much 50 years hence? This process cannot continue indefinitely, and our science curricula are likely to remain "constant volume systems." There will be resistance to increasing the total time spent in college and to giving a larger proportion of the undergraduate time to science at the expense of humanistic studies.

What methods remain for coping with this formidable information inflation? Improvement in high school courses is one method. Another is better organization of this expanded information, which implies an earlier emphasis on fundamental principles, which the student can use to systematize the information to which he is exposed. This approach was emphasized 15 years ago by Linus Pauling in the preface to the first edition of his *General Chemistry*:

> Chemistry is a very large subject, which continues to grow, as new elements are discovered or made, new compounds are synthesized, and new principles are formulated. Nevertheless, despite its growth, the science can now be presented to the student more easily and effectively than ever before. In the past the course in general chemistry has necessarily tended to be a patchwork of descriptive chemistry and certain theoretical topics. The progress made in recent decades in the development of unifying theoretical concepts has been so great, however, that the presentation of general chemistry to the students of the present generation can be made in a more simple, straightforward, and logical way than formerly.

How far can one go in emphasizing principles and theories at the

expense of factual chemistry and still be able to classify the product as a chemist? There is certainly evidence that this theoretical approach can be pushed to a degree which engenders a disregard for the experimental method and which can lead to an unrealistic misuse of theory.

A third challenge is the exceptional student, one with the potentialities which could enable him to become a creative and productive scientist. Our country must produce such scientists in increasing numbers, to keep pace with scientific and technological advances. This exceptional student must have intelligence of a high order, intellectual curiosity and imagination, scientific integrity, and exceptional motivation. The efforts being expended on the high school science courses will bring more of these students into the colleges. The challenge to the college is to maintain and strengthen their motivation rather than to stifle their interest with poor teaching and repetitious courses.

One way to meet this challenge is to arrange the college curricula so that such students are given full credit for work which they have done, and are allowed to proceed at whatever pace they can maintain. Another method is that dramatically demonstrated 40 years ago by Arthur A. Noyes at the California Institute. He took a personal interest in such students and gave them as undergraduates the opportunity for independent research. I avoid the term "undergraduate research," which is often taken to mean a required senior thesis. I am skeptical of required research at the undergraduate level, because all students should not be required to try to fulfill such a requirement. There are brilliant students with predominantly theoretical interests who profit more from advanced courses; there are mediocre students who will profit more from closely outlined laboratory experiments.

There is no required research in the undergraduate chemistry curriculum at the California Institute, but there has been a vigorous program of research in chemistry by undergraduates since Dr. Noyes came on a full-time basis in 1920. Qualified students are given the opportunity, from their freshman year on, to undertake research under the direct supervision of staff members. They receive academic credit for this, which can be used to satisfy elective requirements of the junior and senior years. Increasing numbers, working through the summer period, receive academic credit for this work without payment of tuition.

Here is an unusual but illustrative example of this program. Two years ago, Prof. J. D. Roberts was approached by a freshman who was interested in Prof. Roberts' use of nuclear magnetic resonance as an aid

to studying the structure of organic compounds. The student had worked with electronic equipment in high school, and he wanted to undertake some nuclear magnetic resonance research with Dr. Roberts. He had learned something about the subject; his grades were good. Accordingly, he was allowed to begin work on a simple project. He worked during his spare time for the remainder of the freshman year, the summer following, and the sophomore year. As a result, three papers have been submitted for publication and another is being prepared. As a sophomore, he presented a report of his work before our weekly Research Conference. The level of his report can be judged by the fact that a staff member asked if the speaker was a visiting lecturer being considered for an appointment!

A revision of the undergraduate chemistry curriculum at the California Institute was put into effect in 1956 to meet these challenges. Since World War II there had been a continuous decrease in the number and quality of students electing to major in chemistry or chemical engineering. The election of a major is made at the end of the freshman year, which is uniform for all students. More disquieting was the observation that students entering with an expressed interest in chemistry were electing other fields at the end of their freshman year.

In seeking an explanation, there was found evidence that the laboratory work of the freshman general chemistry course was not meeting the first two challenges mentioned above. Although most of our students had had high school chemistry courses, the laboratory work failed to take advantage of this training. Most experiments were repetitious of those already done. The students were not being challenged. Also many of the experiments were influenced by the period when chemistry was a predominantly descriptive science, i.e., they followed the historical development of chemistry and required the assimilation of a large mass of descriptive material prior to the development of principles which would systematize this material.

A committee composed of Profs. Carl Niemann, John D. Roberts, and myself, was asked to consider a revision of the work of the freshman year, and if appropriate, of the whole chemistry and chemical engineering curricula. After study, we recommended that an experimental curriculum be initiated in which the conventional laboratory work of the first two quarters of the freshman year be replaced by quantitative experiments, equivalent to those then being given in the sophomore course in basic quantitative analysis. We based this recommendation on several observations: First, there was evidence that the freshman laboratory work had

not recognized that science and engineering were becoming more quantitative in theory and practice. This justified including in our freshman course experiments which would develop the ability of the student to plan, execute, and critically interpret quantitative measurements. Also, it seemed imperative that students should develop an appreciation for the experimental method which is the basis of scientific progress.

Second, the committee believed that by proper selection of these quantitative experiments, the principles underlying types of chemical reactions could be more clearly illustrated. If the student mastered these principles he would be better prepared to apply them to the qualitative analysis course in the third quarter, and to appreciate the systematization of inorganic chemistry which a qualitative system can provide. This reversal of the usual sequence of the qualitative and quantitative courses had been used in the sophomore year since 1922. It was found to be successful in the freshman course. It had been assumed that it would not be more difficult to teach freshman students quantitative techniques than it had been to teach these to sophomores; there would be some advantage because of the absence of dubious habits acquired from the use of pseudo-quantitative instruments and techniques in the freshman year. Subsequent experience demonstrated the validity of this assumption.

Finally, we assumed that quantitative analytical experiments could be so taught that they would be effective in arousing the interest of the general student and in maintaining the motivation of those with an interest in chemistry . . . Analytical chemists realize that qualitative analysis is no longer included in the curriculum because of its professional value, but because of its unique potentialities for teaching systematic inorganic chemistry. Similarly, they must recognize that, although automation and instrumentation have decreased the professional values of the quantitative analysis course, by a shift of objectives the course can be used to give the student an appreciation of the methods and problems involved in making quantitative measurements, regardless of the instrument used or whether the measurements are to be applied to chemical, physical or engineering systems. The course can also demonstrate the application of principles to the control of typical reactions, and provide a representative background of descriptive inorganic chemistry. Its success will depend on how effectively both students and staff are convinced that the training of analysts is not the primary objective.

Finally, it was believed that present-day freshmen students were sufficiently mature and motivated to be challenged by quantitative work done

on a professional level. Also, the quantitative analysis of unknowns would provide interest and an opportunity for the student to test his own experimental competence against professional standards. Initially there was justifiable criticism that too large a proportion of the work was conventional gravimetric and volumetric procedures.

As of last year, there were added calibrations involving the conversion of the apparent weight in air of a liquid at one temperature to the corresponding volume occupied by that liquid in a glass container at a different temperature; there were gas volumetric methods; there were coulometric and electrolytic methods involving measurements of electrical potential, current, resistance, and total quantity of electricity passing in a given time; and there were colorimetric methods involving measurements of light intensity. This is followed in the third term by qualitative analysis done on a semi-qualitative basis.

As a result of shifting quantitative analysis from the second year into the first, the basic organic course was moved from the junior to the sophomore year. The basic physical chemistry course remains in the junior year, but instead of the organic laboratory, there is now a one-quarter course in advanced quantitative analysis and two quarters of physical chemistry laboratory. Because of these shifts, a student now completes his basic courses by the end of his junior year. The senior year is free, except for required humanities work, for the student to take research or graduate-level courses in special fields. We are seriously considering advising mature and capable students to enroll in graduate school after completing the junior year.

To what extent has this curriculum been successful? The results have been most apparent in the first year, where there has been dramatic improvement in the application and interest of the students in laboratory work. There was an increase of approximately 60% in the number of students electing to major in chemistry or chemical engineering, and this increase has been maintained. The acceleration of the basic courses has left more time for research or for advanced courses in the last two years. The curriculum is still considered experimental, although it is now in its fifth year. I hope that this attitude continues indefinitely. Though this curriculum has been reasonably successful at the California Institute, one cannot conclude that it would be equally effective at other schools. The ideal curriculum for a given school is determined by the interests and capabilities of the staff and the students of the school at that particular time.

The report of the Bucknell Conference on the Undergraduate Train-

ing of Chemistry Majors, in the May 1961 issue of the *Journal of Chemical Education* is evidence of the current trend to re-examine the objectives, content, and sequence of various courses and to apply the experimental method to this re-examination. The diversity of proposals made will provide interesting reading for anyone considering changes in a chemistry curriculum.

The revised chemistry curriculum at the California Institute has not been the result of the activities of any one person but has been a cooperative undertaking, in both planning and execution, of the members of the Division of Chemistry & Chemical Engineering. The time and effort which they have contributed has been responsible for the degree of success which has resulted. Continuous expenditure of both time and effort will be required, if any curriculum is to meet the challenges of these rapidly changing times.

Ernest H. Swift as a Friend

Prof. William N. Lacey

Professor of Chemical Engineering, California Institute of Technology, Pasadena, Calif.

(Presented when Dr. Swift received the Honor Scroll of the Western AIC Chapter, at a dinner meeting in Pasadena, Calif., September 20, 1961.)

BEFORE Ernest Swift arrived from Virginia, I had an excellent chance to be tennis champion of the faculty of Throop College of Technology. After his arrival I had no breath of a chance. I have played against him many times over a period of years but never could win. This seems at first a most discouraging outlook, but it did not work that way. Ernest has that rare ability to modify his game to suit his opponent, always giving him a fighting chance but never giving him anything he didn't earn. This procedure is stimulating and exhilarating because you always feel that this is the time when you will get results. If you outdo yourself, however, and threaten to do him in, he always has a reserve to draw upon. I suspect that Dr. Swift has used similar tactics many times in his teaching career.

Ernest's choice of Throop for his graduate work almost certainly was made on account of the coming of Dr. A. A. Noyes from M.I.T. Ernest was already interested in analytical chemistry and Dr. Noyes was famous for his contributions to that field and to the relatively new field of physical chemistry. In this case, the professor and the graduate student struck a

sympathetic chord immediately and a collaboration and close friendship started then, lasting many years until the death of Dr. Noyes.

This sort of collaboration was not as simple as it sounds. Dr. Noyes, who was a confirmed bachelor, arrived in the laboratory between five and six in the morning, working steadily until about nine-thirty. Then he went home (about two blocks) for breakfast. He returned to the laboratory before eleven and worked until two. Then came his lunch and a rest period, followed by concentrated work from four until seven-thirty. He always liked to have his students in the laboratory while he was there, although they did not really need to take the rest period and were welcome to work on later in the evening. As you can see, and as his colleagues soon found out, this regimen posed some problems as to meals and sleep.

Despite the rigors of such a life, Ernest found time to court and win the campus belle, an auburn-haired beauty who was secretary to the secretary of the college. When Dr. Noyes learned of this development (and he was probably the last person to find out about it), he shook his head and said, "Too bad; another good man is lost *by* Science." From past experience he had learned that wives did not thrive on his schedule and, as a result, married scientists gradually backslid to more rational work hours. Elizabeth, however, was able to live through many years of such trials and no doubt on numerous occasions, she shook her head and said, "Too bad, another good man lost *to* Science." But Elizabeth has contributed a lot to the partnership. One example of her wifely forbearance: Ernest received a leave of absence at one time to work on the completion of the manuscript of a well-known text book. He and Elizabeth moved to Santa Barbara and were in a bungalow with a small summer house at some distance from it. Ernest fixed that room up as a study and during the whole period of that leave he was permitted to disappear, completely undisturbed except for meals, from morning to night—a wonderful way to enjoy a place like Santa Barbara!

Ernest has a great array of friends and, as one of them, I think particularly of one characteristic of his. Over many years I have felt free to go to him to discuss problems of one sort or another. He always gave his thoughtful consideration, giving either a good solution or at least a valuable suggestion. In many cases, he would call me up the next day with a still better suggestion, showing clearly that he had continued to think about the problem after I had left . . . A more willing, helpful, congenial, and treasured friend would be difficult to find.

Ernest H. Swift — Analytical Chemist

Dr. Lee A. DuBridge

President, California Institute of Technology, Pasadena, California

(Biographical sketch presented when Dr. Swift received the Honor Scroll of the Western AIC Chapter, at a dinner meeting at the Huntington-Sheraton Hotel, Pasadena, Calif., September 20, 1961.)

ERNEST SWIFT was born in Virginia and took his bachelor's degree from the University of Virginia in 1918. He then had the good judgment to come to the West Coast to an almost unknown institution called the Throop College of Technology in Pasadena. He arrived in the fall of 1918 to begin his graduate work, and has been at what is now Caltech ever since.

Throop College of Technology may have been a fairly obscure institution in 1918 as far as the world at large was concerned, but it already had the beginnings of a distinguished chemistry department which was, even then, under the leadership of that great man, Arthur Amos Noyes. Dr. Noyes was already gathering around him a group of distinguished colleagues and students who formed the core of what was soon to become one of the leading departments of chemistry in the country. Thus, Ernest Swift's perspicacity was revealed at an early age when he picked this young and coming department as the place to pursue his graduate studies. He received his Ph.D. in 1924. He immediately became a member of the faculty and has served as a faculty member ever since.

No faculty member could have devoted himself more earnestly, more assiduously, and more effectively to his duties than has Ernest Swift. He has been a distinguished and effective teacher. He has maintained a continuous pace in effective research. And he has been an outstanding campus citizen. He inherited from Dr. Noyes a devotion to the ideals on which Caltech was founded and has pursued these ideals with vigor, devotion, and enthusiasm for over forty years. He has been a steadfast proponent of every forward step taken at the Institute in the interests of scientific integrity and academic excellence. He has opposed any move which would have compromised these ideals. He has always believed that scientific teaching and research at Caltech should be aimed at the pursuit of fundamental knowledge in science for its own sake.

I am indebted to Dr. Swift's colleague, Prof. Carl Niemann, for the following material on Dr. Swift's scientific achievements:

Ernest Swift is known as an analytical chemist. However, he is really interested in chemistry in its broadest sense. His approach to analy-

tical chemistry has consistently been based upon the quantitative application of general chemical principles to particular analytical problems. He has devoted as much, if not more, attention to the elucidation of the fundamental properties of chemical and electrochemical systems as to their application to specific problems. It is no accident that his conception of analytical chemistry has resulted in its continued use for the teaching of chemistry in a period when the common, less inspired, and more empirical approach was rapidly being abandoned.

Recognizing that analytical separations involving varying oxidation states of an element could not be treated rationally in the absence of basic thermodynamic data, Ernest Swift's first publication on the electrode potential of bismuth was devoted to the acquisition of this basic knowledge. His early work on the separation of gallium from other elements through the use of a water immiscible extractant tells us much about the complex ions of gallium and their equilibrium constants, even if we have no interest in separating gallium itself. The same is true for his later studies on the partition of ferric chloride between aqueous hydrochloric acid and several ethers. In addition to its analytical applications, this work is of continuing value for an understanding of the properties of an important class of complex ions.

Obviously, I cannot review all of the contributions which Ernest Swift has made to analytical chemistry. But our chemists tell me that his reasoned and basic approach has resulted in the elaboration of a number of new analytical methods and new systems of analysis—usually, if not invariably, accompanied by the disclosure of new chemical principles. His development of the technic of coulometric analysis, for example, where the reagent is generated electrolytically, is notable for its thoroughness and imaginative application. Other studies in analytical chemistry illustrate his ability to penetrate the fog of total empiricism and to state and then solve a problem in terms of fundamental chemical principles. These studies are of as much interest to the physical organic chemist working with reaction mechanisms as to the analytical chemist.

In all his research publications and in the several textbooks he has written, Ernest Swift has provided a forceful example of the solution of particular problems through the systematic application of the basic principles.

During World War II, Ernest Swift was leader of a group which, in addition to other tasks, was charged with the responsibility of devising a system of analysis for the detection and identification of all possible

chemical warfare agents, including those not known to the Allied Forces. A system was developed, military personnel were trained in its use, and it was tested in the closing days of the war when his trainees identified a family of chemical warfare agents known only to the Germans, and achieved results within 24 hours after captured samples were obtained. The vitality of this system of analysis and its approach can be appreciated, when it is realized that in a modified form it is currently being used at Caltech to teach freshmen the principles of chemistry and to illustrate the general use of the scientific method.

(See p. 453 for the Presentation to Dr. Swift)

Dow Corning Corporation, Midland, Mich., recently announced the development and availability of a new line of heat, cold, and oxidation-resistant fluorosilicones. The fluorosilicones differ from the dimethyl silicones by having fluoroalkyl groups substituted for some of the methyl groups, producing polymers which offer additional properties of good solvent resistance and improved lubricity. The fluorosilicones introduced were: Dow Corning FS 1265 Fluid: Dow Corning FS 1280 and FS 1281 Compounds (valve lubricants); and Dow Corning FS 1290 and FS 1291 Greases (Lithium soap-thickened lubricants).

Dr. Max Bender, F.A.I.C., has joined the faculty of the chemistry department of Fairleigh Dickinson University as assistant professor, on the Teaneck Campus. He was formerly senior research chemist with American Cyanamid Co. He is teaching analytical and physical chemistry, and doing consulting and research in physical and colloid chemistry.

Communications

"Inventory of Critical Manpower"

To the Editor:

As an AIC representative on the Scientific Manpower Commission, I believe it would be of interest to all members of the AIC to read the booklet entitled, "Inventory of Critical Manpower" published by S.M.C. and E.M.C.

This booklet clearly indicates the military situation as regards young scientists and engineers at the present time. It points out how the employer of these men can make an inventory of his personnel and find out where he may lose men to the military, who now occupy key positions in his own organization.

It should be remembered that when a reservist is called, there is no appeal except to the people who are "calling." The point is that any argument for a man must be made now and before the man is called.

Those who wish to purchase a copy ($1.00) of this inventory may do so by writing the Engineering Manpower Commission, 345 East 47th Street, New York, N. Y.

—Dr. D. B. Keyes, F.A.I.C.
New York, N. Y.

Chemists Help Small College

To the Editor:

We appreciate the article, "Undergraduate Research at Alabama A. & M. College," by Dr. Vandon E. White, in the October issue of THE CHEMIST. Our college is small and is in the community in which the Redstone Arsenal is located. The college is anxious to develop and maintain an excellent program so as to graduate students with alert minds and good training. We are grateful for the excellent suggestions and assistance, including equipment, that has come from members of THE AMERICAN INSTITUTE OF CHEMISTS, the American Chemical Society and some personnel associated with industries in this section. Certainly this contribution is of inestimable value.

—R. A. Carter, F.A.I.C., Dean
Alabama A. & M. College
Normal, Ala.

Precepts Pertinent to the Professional Life of Dr. Swift

Prof. Paul D. V. Manning, Hon. AIC

California Institute of Technology, Pasadena, Calif.

(The Presentation of the Honor Scroll of the Western AIC Chapter to Dr. Ernest H. Swift, September 20, 1961, at Pasadena, Calif.)

THE AMERICAN INSTITUTE OF CHEMISTS is an organization of chemists and chemical engineers. It was founded in January, 1923. Today it has 28 Chapters and its roster is approaching 3000 members who pay dues for the opportunity of working together toward the common objective of advancing the professions of chemist and chemical engineer in the United States. The major interest of the AIC lies in emphasis of the chemist and the chemical engineer—the professionals and their relationship to their sciences.

Dr. Karol Mysels (left) of the University of Southern California, chairman of the Western Chapter, presiding at the Honor Scroll Award meeting for Dr. Swift (right).

Among the canons which our members have set up as guides in moving towards the goal are three which are particularly pertinent to the professional life of Dr. Ernest H. Swift. They are:

> (1) Every individual, on entering the profession of chemistry and thereby becoming entitled to full professional fellowship, incurs an obligation to advance the science and art of chemistry, to guard and uphold its high standard of honor, and to conform to the principles of professional conduct.
>
> (2) Its members as chemists and chemical engineers will establish and maintain a standard of proficiency of such excellence as to insure competent and efficient service.
>
> (3) Its members will cooperate with all the agencies serving chemistry to make the professions of chemist and chemical engineer powerful factors in the advancement of intellectual and material progress in the United States of America.

All of us who have been privileged to know and work with Ernest Swift recognize that these are precepts synonymous with his professional ideals and attitude. The Western Chapter of THE AMERICAN INSTITUTE OF CHEMISTS, with the full and unanimous approval of the National

Council and Officers, is therefore awarding an Honor Scroll of the AIC to Ernest Haywood Swift, with this citation:

For the many years devoted to teaching—
For the promotion and development of his profession—
And for his concern and attention to those within the profession of chemistry.

May I add that in Ernest Swift we see exemplified the nobleness of character which creates the aristocracy of the profession.

Chemical Books Abroad

By Dr. Rudolph Seiden, F.A.I.C.

Editio Cantor, Aulendorf i. Wuertt.: *Pyrazolone und Dioxo-pyrazolidine*, by W. Krohs and O. Hensel; 1961, 508 pp.; DM 98.—A monograph bringing together all there is known about the physical and chemical properties of 1-phenyl-3-methyl-pyrazolone (5), or antipyrine, and its derivatives which include Pyramidon, Veramon, Novalgin, Butazolidin and other drugs, as well as some dyestuffs.

Butterworth (London), Washington: *Progress in Medicinal Chemistry, I*, by G. P. Ellis and G. B. West; 1961, 271 pp.; $11.25.—A well-organized review of the current status of various fields of medical chemistry, written primarily for biochemists and pharmacologists by well-known experts. The main chapters discuss screening tests, hypotensive agents, tranquilizers, diuretics, hypoglycemic drugs, and antifungal agents.

World Health Organization Geneva (Columbia University Press, New York). *Specifications for Pesticides;* 1957, 400 pp.; $8.—A manual, established by the WHO, to serve as a guide for users of insecticides, rodenticides, and molluscicides, as well as for spraying and dusting equipment.

Information about Postdoctoral Fellowships and Graduate Fellowships of the National Science Foundation for 1962-1963 is available from the Fellowship Office, National Academy of Sciences-NRC, 2101 Constitution Ave., N.W., Washington 25, D.C.

Education for Excellence — a Price of Freedom

Dr. Arthur Osol, F.A.I.C.

Director of the School of Chemistry and Dean of Science,
Philadelphia College of Pharmacy and Science, Philadelphia 4, Pa.

(Presented, here slightly condensed, at the Student Award Meeting of the Philadelphia AIC Chapter, May 4, 1961, in Philadelphia, Pa.)

HOW many of us regard freedom, our priceless heritage, as a very real, personal, and tangible asset? Do we consider the sacrifice, too often of life itself, made by the brave men and women who founded this nation, to have been worthwhile and worthy of our esteem? Were the sacrifices made by the patriots who followed the ideals of the founders of equal worth? Are we discerning enough to see that, just as the legacy of freedom has had to be earned in each of the 185 years of our history, we shall every year have to continue to earn it, if we want to preserve it?

How seriously do we take our freedom? Truly, most of us are indifferent about it, and do little to show appreciation for our precious heritage or our determination to maintain it. Dr. Ralph W. Sockman, distinguished clergyman, has said:

> The great mass of us go on immersed in our individual interests of getting ahead and having a good time. We echo the cliches about Communists and repeat the popular courses on the "pinks." But most of us do not give much thought to the deeper sources and safeguards of our freedom. We Americans should study our freedom as well as boast about it.

I confess that often, absorbed in my own interests, I have failed to meet fully my responsibility for ensuring the continuance of our freedom, so that generations to come may have it as their legacy. This responsibility is for me even greater than it is for you, for your freedom and opportunity were not my birthright, but rather an unconditional and outright gift to a stranger cordially welcomed to your shores from the then Russian province of Latvia. If you are acquainted with the tribulations of life in Russia and its provinces even in the early years of this Century, you will understand the depth of my gratitude to the United States for this privilege of sharing its freedom and opportunity. I wish that every one so fortunate as to have been born in this country would realistically appraise the value of his birthright, treasure it, and do all within his power to preserve it.

Recently I had the opportunity to see what loss of freedom and liberty would mean to those of us who have become so accustomed to it that we have lost appreciation of its value. My wife and I spent some time in the USSR, visiting Leningrad, Moscow, and Riga, in Latvia, where I was born. In Leningrad I asked our Intourist guide, a language major at the

University, such questions as these: Could she decide, by her own volition, what career she will select upon graduation from the University? May she, if she wished, start a small business—say, a small restaurant specializing in a unique style of cooking? May she choose the kind and location of her living quarters? I did not embarrass her by asking what freedom of choice she has in electing the head of her country.

These are not questions for the individual to decide, our guide replied. Career decisions are made on the basis of a determination of the area in which the individual can serve his country most effectively; perforce, others have vital concern and authority in the making of such decisions. Businesses, small or large, are all owned by government, and it alone makes the decision whether or not one is to be started, and who shall run it for government. Nor is the choice of living quarters to be made by the individual. Government assigns living quarters according to a person's status (if any) in the Communist party, his professional standing, and the size of his family. In Moscow there are thousands of small sidewalk stands at which all kinds of articles are sold, but not one of these small "enterprises" may be owned by an individual. In Riga, where during the brief days of the Latvian Republic freedom thrived, now not even a small pharmacy or other professional establishment may be privately owned.

When a citizen of a free country learns that choices such as these, and many others, which he is free to make in his country, are denied him under communism, he begins to appreciate the true meaning and value of freedom. Is not the right to make up one's own mind freedom's noblest endowment? While in the USSR, we also had ample opportunity to observe how thorough and deliberate is the indoctrination of their citizens, young people especially, with the philosophy of communism, to the end that all are subservient to government. No doubt the Soviet citizens sincerely believe they have freedom, but what a difference there is in the USA and USSR concepts of freedom! For those who take the priceless possession of our kind of freedom lightly, I recommend a brief visit to the USSR—they will be infinitely more effective and appreciative citizens of our land when they return.

But possession of freedom no more ensures national excellence than the lack of it does not. A visitor to the USSR sees everywhere abundant evidence of progress, much of it excellent. Moscow is the showplace of the nation. Largely rebuilt and expanded, it has mile upon mile of new, 9 to 11 story apartment buildings; streets with as many as 14 traffic lanes, the busier intersections provided with underground passageways for pedes-

trians; the fabulous 32-story Palace of Science and the associated buildings of the University of Moscow; the 56 different underground marble "palaces" that comprise the stations of the city's subway system; modern busses that serve the city and its environs on an extraordinarily good time schedule; 1200 libraries headed by the 20-million book Lenin library, and an over-all spic and span appearance. But we must not delude ourselves in believing that progress is to be seen only in moscow. In 1958, Dr. Franklin D. Murphy, then Chancellor of the University of Kansas, with a group of university presidents charged with the responsibility of evaluating Soviet higher education, visited Kazakhstan, one of the Soviet republics, and reported:

> Fifty years ago the population of Kazakhstan, consisted of nomadic sheep herders with almost 100% illiteracy. Today Alma Ata, its capital, is a modern, bustling city with an academy of science, medical school, university, and laboratory of atomic physics. All are being operated by Kazakhs. Illiteracy has been practically eliminated in that area.

There are other evidences of Soviet progress that we should consider. William Benton, publisher of the *Encyclopaedia Britannica* and one-time Assistant Secretary of State, recently wrote a series of articles reporting the progress he observed in the USSR since an earlier visit. He stated that almost four times as many books are published in Russia, whose population is not much larger than ours, as in the U. S.—48,000 to 50,000 book titles to our 15,000. He noted that the average Russian and the average German read far more books than does the average Briton, who in turn reads far more books than the average American. He explained that Russians are trained to read; that in school they are taught that the way to get ahead is to achieve knowledge, and that books are the keys to that knowledge.

Why are we, in this land so lavishly endowed with Nature's gifts, and blessed with priceless freedom and liberty, literally fighting for our survival? Dr. Murphy,* previously quoted, gives part of the answer:

> The shocking complacency among our people frightens me. There is a subconscious notion that merely because Western civilization achieved and has maintained primacy for 1300 years, it is somehow preordained by the Creator that, regardless of what we do in the future, we will still maintain our position. The trouble is that too few of us have read history and therefore too many fail to comprehend that "the bigger you are, the harder you fall."

*Quotations are from a guest editorial, "Our Dangerous Complacency," in the December 1959 issue of *National Education Association Journal*.

What can we do to improve our status? As student and teacher, our common interest is education, which is the front line of defense in the battle of survival. We have long paid lip service to education and its values, but we have done all too little to attain excellence in education and to activate the philosophy of education for excellence. Many individuals and organizations recognize the validity of this dual concept, as when, for example, the AIC honors outstanding chemistry graduates, but the mass of U. S. citizens have not come to a practical realization that our educational effort and programs must be no less than the best. At his induction, April 4, 1961, as U. S. Commissioner of Education, Dr. Sterling M. McMurrin said:

> Although the quality of our education has improved considerably over the past few years—from elementary school through college—it is not as good as it should be. Too often we fail to elicit both from our students and teachers their best efforts. We must have greater rigor at all levels in order to achieve the proper ends of education and guarantee excellence in our society.

If, as Dr. McMurrin concluded, "education is the road to cultural enrichment, to intercultural communication, to worldwide understanding . . . and to genuine freedom," we in the U. S. had better re-evaluate our sense of purpose and of values with regard to education. How far may we expect to go along this road when annually we spend $14-billion for cars, somewhat more than this for their maintenance, $10.5 billion for liquor, $3-billion for radio and television sets, and only $3-billion for higher education? Can we say truthfully that we believe in education, when as much money is passed through the parimutuel windows at horse-racing tracks each year as is received by our colleges and universities?

There can be no doubt that all of us in the U. S. have our work cut out for us, if we sincerely believe, and would have others believe, that our kind of freedom is superior to any other national way of life; indeed, that it is man's inalienable right, endowed by his Creator. If you members of the rising generation who have been privileged to complete a college education, believe this, your work for our Nation is to continue your education through all the years of your life. Far from marking the conclusion of your education, your degree should mark the beginning of a new, longer and happier phase of it. Will you accept the challenge of our country's need for excellence in education, and of education for excellence? Your affirmative response, accompanied by your positive action, is the least you can pay for your heritage of freedom, when others have paid for it with their lives!

The Northeast Section of the American Chemical Society is sponsoring an all-day seminar, Feb. 21, 1962, entitled, "Current Trends in Chemistry," to be held at the 1200 Beacon Street Motel, Brookline, Mass. For information, Northeast Section, ACS, Department of Chemistry, Tufts University, Medford 55, Mass.

Professional Appointments

Dec. 11, 1961. Croghan, N. Y. Miller House. Meeting of Beaver Falls Chapter. Panel Discussion on "Training Methods in Chemistry & Chemical Engineering." For information, George K. Boger, Jr., Secretary, Beaver Falls Chapter, Beaver Falls, N. Y.

Dec. 12, 1961. Washington, D.C. Army-Navy Town Club. Dinner meeting of Washington Chapter. For information, Donald C. Holmes, chairman of program committee, 121 No. Wakefield St., Arlington 3, Va. (Telephone: Office OX 7-9809; Home, JA 7-5123.)

Dec. 12, 1961. Huntsville, Ala. Joint meeting of Alabama Chapter and North Alabama ACS Section. Speaker: Dr. Harold Schechter of the Ohio State University. Subject, "Steric and Ionic Effects in the Schmitt Reaction." For information or reservations: Birmingham: Southern Research Institute, Robert E. Lacey, FAirfax 3-6592; Huntsville: ARGMA, Martin B. Williams, 876-8226; Tuscaloosa: U. S. Bureau of Mines, Ellis E. Creitz, PLaza 2-8438.

Dec. 16, 1961. Tuscaloosa, Ala. University Club, University Ave. (U. S. Highway 11) Dinner meeting of Alabama Chapter. Speaker: The Hon. Armistead I. Selden, Jr., U. S. Representative from the 6th Congressional District of Ala. and Chairman, House of Representatives Sub-Committee on Inter-American Affairs. Subject: "Leftist Leanings in Latin America." For reservations: Birmingham: Southern Research Institute, Robert E. Lacey, FAirfax 3-6592; Huntsville: ARGMA, Martin B. Williams, 876-8226; Tuscaloosa: U. S. Bureau of Mines, Ellis E. Creitz, PLaza 2-8438, or University of Alabama, Dr. Kirby E. Jackson, PLaza 2-7441, Ext. 572.

Jan. 10, 1962. Los Angeles, Calif. Roger Young Auditorium. Meeting of Western Chapter. Subject: Legal Definition of a Chemist. For information: George H. Dye, Pennsalt Chemicals Corp., 2700 South Eastern Ave., Los Angeles 22, Calif. Telephone: RA 3-9711, Ext. 29.

Jan. 11, 1962. New York, N. Y. Meeting of New York Chapter. Honorary

Membership Dinner. Details to be announced. For information, Miss Mildred Hunt, Secretary, New York Chapter, c/o The Sugar Research Foundation, Inc., 52 Wall St., New York 5, N. Y.

Jan. 16, 1962. New York, N. Y. The Chemists' Club. Meeting of AIC Board of Directors and National Council. Board meets at 5:30 p.m. Council meets at 6:00.

Jan. 17, 1962. Wilmington, Del. The Powder Mill on Kennett Pike. Dinner meeting of Delaware Chapter, 6:30 p.m. Speaker, Werner H. Hutz of Connolly, Bove & Lodge. Subject: "Importance of Patent Protection for the Chemist." For reservations, Dr. J. Frederic Walker, E. I. du Pont de Nemours & Co. PRospect 4-6850.

Feb. 1, 1962. Philadelphia, Pa. Penn Sherwood Hotel. Philadelphia Chapter. Honor Scroll Award Dinner. Recipient to be announced. For reservations: Dr. Justo B. Bravo, Research & Development Div., Sun Oil Co., Marcus Hook, Pa. Telephone: HU 5-1121, Ext. 627.

Mar. 5, 1962. Beaver Falls, N. Y. Meeting of Beaver Falls Chapter. Speaker, Dr. Vivian T. Stannett. Subject, "Graft Polymerization." For information, George K. Boger, Jr., Secretary, Beaver Falls Chapter, Beaver Falls, N. Y.

Mar. 14, 1962. Los Angeles, Calif. Roger Young Auditorium. Meeting of Western Chapter. Subject: Labor Unions for Chemists. For information: George H. Dye, Pennsalt Chemicals Corp., 2700 South Eastern Ave., Los Angeles 22, Calif. Telephone: RA 3-9711, Ext. 29.

Mar. 15, 1962. New York, N. Y. Meeting of New York Chapter. Details to be announced. For information, Miss Mildred Hunt, Secretary of the New York Chapter, c/o The Sugar Research Foundation, 52 Wall St., New York 5, N. Y.

April 5, 1962. Philadelphia, Pa. Engineer's Club. Dinner Meeting of Philadelphia Chapter. For reservations: Dr. Justo B. Bravo, Research & Development Div., Sun Oil Co., Marcus Hook, Pa. Telephone: HU 5-1121, Ext. 627.

Apr. 5, 1962. Newtown Square, Pa. Newtown Square Inn (Route 252, 1 block south of Westchester Pike). Joint meeting of Philadelphia and Delaware AIC Chapters. Dinner 6:30 p.m. Meeting 8:30 p.m. Speaker, Dr. Brian Conway, Professor of Chemistry, University of Ottawa, Ottawa, Canada. Topic, "Impressions of Science in Russia." For information: Dr. Ezra H. Bitcover, 8237 Michener Ave., Philadelphia 50, Pa., or Dr. Walter W. Thomas, Research Dept., Hercules Powder Co., Wilmington 99, Del.

Apr. 19, 1962. New York, N. Y. Meeting of New York Chapter. Details to be announced. For information, Miss Mildred Hunt, Secretary, New York Chapter, c/o The Sugar Research Foundation, Inc., 52 Wall St., New York 5, N. Y.

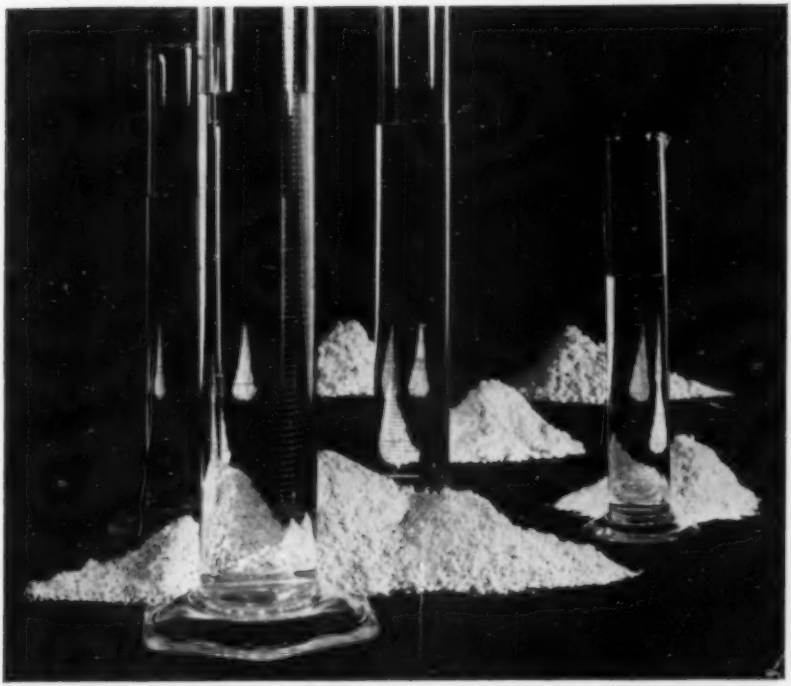
May 3, 1962. Valley Forge, Pa. Tally-Ho Motel-Hotel, on Route 202. Meeting of Philadelphia Chapter. Student Award Dinner. Speaker, Dr. Charles C. Price, Director, John Harrison Lab., University of Pennsylvania. Teachers and parents of awardees invited. For reservations, Dr. Justo B. Bravo, Research & Development Div., Sun Oil Co., Marcus Hook, Pa. Telephone: HU 5-1121, Ext. 627.

May 9, 1962. Los Angeles, Calif. Roger Young Auditorium. Meeting of Western Chapter. Student Awards will be presented. For information, George H. Dye, Pennsalt Chemicals Corp., 2700 South Eastern Ave., Los Angeles 22, Calif. Telephone: RA 3-9711, Ext. 29.

May 10-11, 1962. Chicago, Ill. Edgewater Beach Hotel. 39 Annual AIC Meeting. The Chicago Chapter will be our host. H. F. Schwarz, Sherwin-Williams Co., 116th St. & Champlain Ave., Chicago 28, Ill., is chairman of the General Arrangements Committee.

May 17, 1962. New York, N. Y. Meeting of New York Chapter. Honor Scroll Dinner. Details to be announced. For information, Miss Mildred Hunt, Secretary of the New York Chapter, c/o The Sugar Research Foundation, 52 Wall St., New York 5, N. Y.

May 8-10, 1963. Philadelphia, Pa. Hotel Warwick. 40th Annual AIC Meeting. The Philadelphia Chapter will be our host. Dr. E. M. Kipp, 161 Hunters Lane, Devon, Pa., and Marcus Sittenfield, 1405 Locust St., Philadelphia, Pa., are the joint chairmen of the Arrangements Committee.



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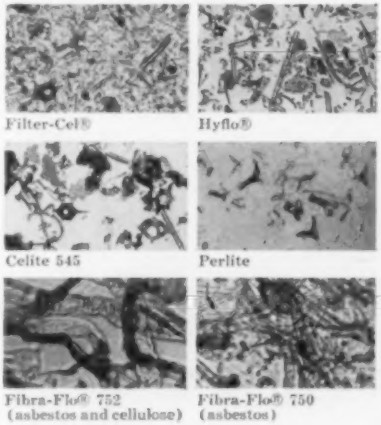

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